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CIVIL GPS SERVICE INTERFACE COMMITTEE
INTERNATIONAL INFORMATION SUBCOMMITTEE

GPS NEWS FROM CEI

(Central European Initiative)

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ABSTRACT

Application of GPS in geodetic and geodynamic programmes of the CEI (Central European Initiative) is reported concisely in the following actions of the CEI

- Second phase of the European Project CERGOP-2/Environment (Central Europe Regional Geodynamics Programme) supported financially by the European Commission;
- Activities in the frame of the CEGRN Consortium (Central Europe GPS Reference Network);

CONCISE INFORMATION ON CENTRAL EUROPEAN INITIATIVE

In November 1989 the Foreign Ministers of Austria, Hungary, Italy and Yugoslavia at the conference in Budapest founded an organisation named QUADRAGONALE. A few months later, in April 1990 (Vienna) former Czechoslovakia joined this organisation forming the PENTAGONALE and in July 1991 at the conference of Prime Ministers in Dubrovnik Poland was admitted creating the HEXAGONALE. In July 1992 the HEXAGONALE was renamed as Central European Initiative. Violent political development in Europe, break-up and civil war in Yugoslavia, disintegration of Czechoslovakia, formation of new countries in the region of Eastern and Southern Europe, all these events caused considerable changes in organisation and international cooperation within the Central European Initiative. The current (as on 1.09.2004) status of the CEI membership is the following: Albania, Austria, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, Italy, Macedonia, Moldova, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia and Ukraine.

The main objectives of the CEI cooperation are to encourage dialogue and cooperation in the region, to strengthen the stabilisation within the region of Central Europe, to promote all-European integration processes, to bring its non-EU members closer to the European Union and to avoid the creation of new divisions among advanced and less advanced countries as well as to help the Central and Eastern European countries in entering the integrated world by adjusting their multi-lateral relations to Western European standards.

The CEI is an intergovernmental organisation of 17 European member countries operating through the annual meetings (usually in November every year) of the Heads of Government and the Ministers of Foreign Affairs. The annually rotating CEI presidency is assisted by the CEI Executive Secretariat in Trieste, Italy. It has the legal status of an international organisation and is responsible for the administrative and conceptual support in the preparation and follow-up activities. The CEI Secretariat for CEI Projects is located in the CEI-ES Headquarters in Trieste

and maintains a permanent office at the EBRD, London, with the task of assisting the CEI with economic, strategies, investment projects, international events and programmes, including the organisation of the CEI Summit Economic Forum.

Working Groups constitute the basic structural component of the CEI. They plan and approve initiatives, agreements and projects which they promote and complete in cases requiring financing, or which they pass to the National Coordinators or Foreign Ministries for approval and financing. At the moment there are 17 CEI Working Groups organising the international cooperation of all 17 CEI member countries in different fields:

In the international cooperation in geodesy and geodynamics take part almost all CEI member countries. At the moment (as on 1 September 2004) the scientists from thirteen CEI countries are very active and participate for years in many actions initiated and organised by the Section. Up to now five CEI member counties do not participate in realisation of Section C programmes. They are Albania, Belarus, Macedonia, Moldova.and Serbia. We do hope that also these countries would be able to undertake the cooperation in the near future. On the other hand two other non-CEI countries, Germany and Finland, closely cooperate in realisation of CEI geodetic and geodynamic programmes.

PROGRAMME OF ACTIVITIES OF THE CEI SECTION C "GEODESY"

Very active international cooperation of the teams of the CEI Working Group on Science and Technology Section C "Geodesy" in application of satellite positioning systems is noted in the following areas:

- **Geodetic and geodynamic programmes.**
  - **Regional European programmes**: CERGOP = Central Europe Regional Geodynamics Project; CEGRN = Central European GPS Reference Network Consortium;
  - **Local geodynamic projects:**
    - **projects realised by the subgroups of the CERGOP** (CERGOP Wokpackages) "Geotectonic Analysis of the Region of Central Europe"; they concern the following regions:
      Eastern Alps and the North and Eastern Adriatic Sea,
      Romania Plate,
      Pannonian Basin;
      Plitvice Lakes, Croatia;
      Tatra Mountains;
      Northern Carpathians;
      Balkan Peninsula;
    - **projects realised in bilateral/multilateral agreements of CEI countries**, e.g. Czech-Polish-Slovak Cross-Border Studies of Regional Geodynamics (Sudetes, Beskydy, Tatra, Pieniny Mts);
- **Working Group on University Education Standards;**
- **Working Group on Satellite Navigation Systems;**
- **Cooperation CEI Section C - European Geophysical Society (EGS);**
- **Cooperation CEI Section C - International Association of Geodesy (IAG).**

Below there is given a concise information on the status of realisation of some selected projects and some gained achievements.

PRESENT STATUS OF THE PROJECT CERGOP

The status of the Project CERGOP (Central Europe Regional Geodynamics Programme) could be characterised by the following statements:

- The first phase of the Project was concluded in 1998 and now the second phase of the Project is being realised. The proposal of the second phase of the Project CERGOP-2 "A Multipurpose and Interdisciplinary Sensor Array for Environmental Research in Central Europe (CERGOP-2/Environment)" was accepted by the European Commission in April 2003 and will be financially supported during the next three years.
- Project consists in upgrading and densification of the existing network CEGRN (Central European GPS Reference Network) to about 80-100 multi-purpose GPS permanent and epoch stations in Central and Southern Europe. The epoch stations will be measured in 2003 and 2005, local campaigns as well as scientific investigations will be carried out during the whole period of the realisation of the Project.
- As a result we expect for a considerable area of Europe (15%):
  - a network set-up operable for the next decade;
  - velocity field and strain maps for future geodynamical investigations and hazard mitigation;
  - data for climate research and weather forecast;
  - data for real time navigation;
  - a seamless data-bank for scientific and public access.
- The following 13 countries participate in the second phase of the Project: Austria, Bosnia&Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Italy, Romania, Poland, Slovakia, Slovenia and Ukraine.
- At present total number of stations of the CERGOP-2 is 63. About thirty CERGOP-2 points are permanent stations (Fig. 1.).
- Seven monitoring GPS CEGRN campaigns were performed in 1994, 1995, 1996, 1997 (CERGOP-1) and in 1999, 2001 and 2003 (CERGOP-2). Next GPS campaign will be organised in June 2005.
- CERGOP Data Centre is hosted by Graz Lustbühel Observatory. At the moment five institutes have declared to maintain and operate CEGRN Processing Centres in the second phase of the Project: FÖMI, Satellite Geodetic Observatory, Penc, Hungary; Institute of Geodesy and Geodetic Astronomy of the Warsaw University of Technology, Warsaw, Poland; Agenzia Spaziale Italiana Centro di Geodesia Spaziale, Matera, Italy; Space Research Institute of the Austrian Academy of Sciences, Austria and Department of Theoretical Geodesy of the Faculty of Civil Engineering of the Slovak University of Technology, Bratislava, Slovakia.
- Project CERGOP was an impulse for establishment of the CEGRN Consortium of institutes involved in realisation of the Project. The Consortium will also be a seedbed of new European projects and initiatives.

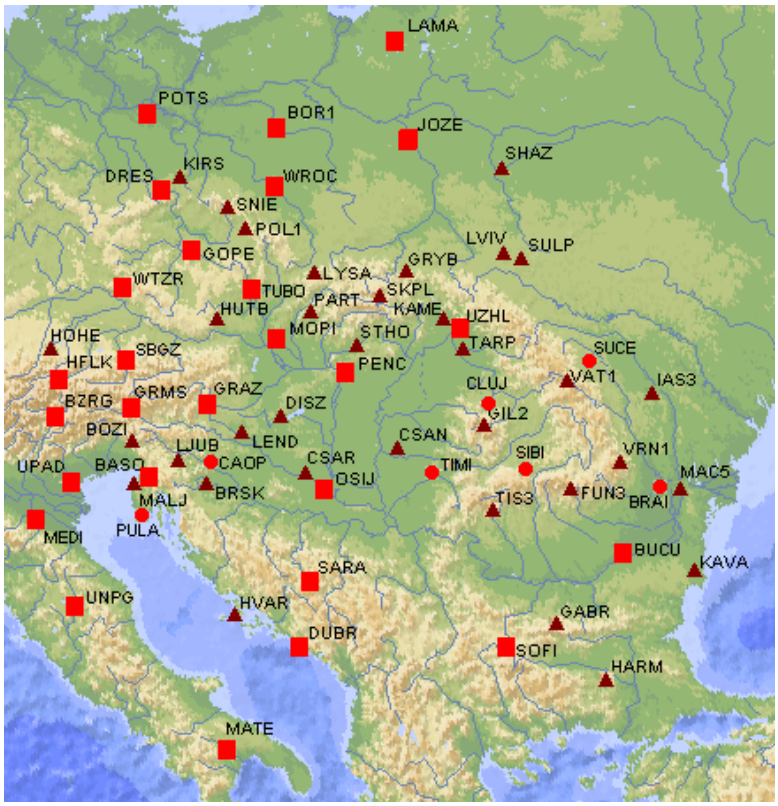

Fig. 1. Present and some proposed sites of the CEGRN
(rectangles – permanent sites, triangles – epoch sites, circles – proposed permanent sites)

*(*after: *I. Fejes, P. Pešec. CERGOP-2/Environment – a challenge for the next 3 years*, Paper presented at the G17 EGS-AGU-EUG Symposium "Geodetic and Geodynamic Programmes of the CEI", Nice, France 2003)

- One of the main important parts of the international activities within the Project CEGOP is the work of CERGOP Study Groups (CSG). At present – in the programme of CERGOP-2 there are seventeen study groups. They cover particular fields of activities supporting realisation of the Project and form the respective "workpackages" of the EU Project CERGOP-2/Environment listed below:

- WP.1. Internet based seamless database for environmental studies (chaired by Austria),
- WP.2. Station quality assessment and upgrade (Hungary),
- WP.3. Periodic determination of the reference frame CEGRN (Hungary),
- WP.4. Creation of new permanent observation facilities in CEI countries (Germany),
- WP.5. GPS data analysis and the definition of reference frames (Slovakia),
- WP.6. Analysis of the long-term coordinate time series (Italy, Padova),
- WP.7. Geokinematical modelling and strain analysis (Slovakia),
- WP.8. Impact of atmospheric effects on GPS height determination (Czech Republic),
- WP.9. GPS based rapid service for meteorology and hazard assessment (Italy ASI),
- WP.10. Geodynamics of Central Europe (Poland),
- WP.10.1. Crustal movements in the Eastern Alps and Northern Mediterranean (Slovenia),
- WP.10.2. Three dimensional plate kinematics in Romania (Romania),

- WP.10.3. Integration of present geodynamic investigations in the Pannonian Basin (Hungary),
- WP.10.4. International geodynamic test area Plitvice Lakes (Croatia),
- WP.10.5. Geodynamics of the Tatra Mts. (Poland, Slovakia),
- WP.10.6. Geodynamics of the Northern Carpathians (Ukraine),
- WP.10.7. Geodynamics of the Balkan Peninsula (Bulgaria).

CEGRN CONSORTIUM
(Central European GPS Geodynamic Reference Network)

Long-term experience gained from the realisation of the Project CERGOP has proved the importance of international collaboration in the field of space geodesy, geodynamics and Earth sciences and the need for a coherent, high accuracy and high quality reference network in Central Europe for geodynamic investigations. It became evident that only a coordinated programme of measurements, scientific and technical development of methods and international access to wide amount of monitoring results gathered in a long period of time can give the proper background for any further geodynamic interpretations.

The CEGRN Consortium is a non-profit organisation of institutes that supports and promotes, coordinated establishment, maintenance and upgrade of CEGRN sites, monitoring the CEGRN by permanent and epoch type measurements and the establishment, maintenance and development of CEGRN Data Centre and Processing Centres.

The member institutes contribute to the CEGRN with their own established and accepted sites, with site maintenance and with coordinated observations on these sites. They are committed for the highest quality standards and a minimum of 5*24 hours observations every second year. They supply observational data to the common Data Centre. Additional contribution of designated institutes consists of operation the Data Centre and/or Processing Centres. The Consortium shall agree on a programme for the development of scientific potential of the CEGRN and shall formulate and submit proposals for new scientific and technological developments. These proposals may specify the member institutes in which such developments should be carried out. The Consortium may submit proposals either to national or international entities.

The "Memorandum of Agreement" of the Consortium was signed on 5 September 2001 in Budapest, Hungary. The representatives of the following institutions have signed the Memorandum of Agreement:

- Space Research Institute, Austrian Academy of Sciences, Graz, Austria
- Geodesy Department of the Faculty of Engineering, Sarajevo, Bosnia and Hercegovina
- Central Laboratory for Geodesy, Bulgarian Academy of Sciences, Sofia, Bulgaria
- University of Zagreb, Faculty of Geodesy, Zagreb, Croatia
- Research Institute of Geodesy, Topography and Cartography, Zdiby, Czech Republic
- Faculty of Civil Engineering and Geodesy, University of Bundeswehr, Munich, Germany
- Institute of Geodesy Cartography and Remote Sensing (FÖMI), Budapest, Hungary
- Centro di Geodesia, Agencia Spaziale Italiana, Matera, Italy
- Department of Geology, Paleontology and Geophysics, University of Padova, Italy
- Institute of Geodesy and Geodetic Astronomy, Warsaw University of Technology, Poland
- The Institute of Cadastre, Geodesy, Photogrammetry and Cartography, Bucharest, Romania
- Dept. of Theoretical Geodesy, Slovak University of Technology, Bratislava, Slovakia

- Faculty of Civil and Geodetic Engineering, University of Ljubjana, Slovenia
- Chair of Geodesy and Astronomy, Lviv Polytechnic National University, Lviv, Ukraine

Five following institutes have declared to maintain and operate CEGRN Processing Centres:

- FÖMI, Satellite Geodetic Observatory, Penc, Hungary,
- Institute of Geodesy and Geodetic Astronomy of the Warsaw University of Technology, Warsaw, Poland,
- Agenzia Spaziale Italiana Centro di Geodesia Spaziale, Matera, Italy,
- Space Research Institute of the Austrian Academy of Sciences, Austria,
- Department of Theoretical Geodesy of the Faculty of Civil Engineering of the Slovak University of Technology, Bratislava, Slovakia.

The CEGRN can be considered as a well-established research infrastructure in Central Europe for Earth sciences. Therefore this infrastructure can be used as a prominent research and educational tool in the region. Most of participating institutions are university institutes with educational experience in Earth science disciplines. Therefore the Consortium can also be a forum for a wide educational activities. Some training programmes initiated and organising by the Section C Working Group on University Education Standards can be realised in cooperation with the Consortium.

The Consortium provides an open discussion forum also for other institutes from all European countries, it forms a broad platform for European international cooperation in the field of Earth sciences, in particular in space geodesy and geodynamics. We expect that the number of member-institutes will increase in the near future.